Asthma In New York's Chinatown After 9/11

Anthony M. Szema, M.D.

ASTHMA IN CHINATOWN AFTER 9/11

- Background
- Hypotheses
- Study Population
- Methods/Data Collection
- Results
- Related Studies
- Summary and Conclusions

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ASTHMA IN CHINATOWN AFTER 9/11
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International Space Station Imagery
globalsecurity.org
Sept 11, 2001

This man , who was pulled from the debris by co-workers on the 91st floor of the World Trade Center's north tower, covers his mouth as he walks through debris after the collapse of one of the World Trade Center Towers. Photo by Stan Honda/AFP.

A woman covered in dust takes refuge in an office building after the top of one of the World Trade Center towers collapsed. The woman was caught outside on the street as the cloud of smoke and dust enveloped the area. Photo by Stan Honda/AFP.

COMPOSITION OF DUST AND SMOKE AEROSOL FROM THE COLLAPSE OF THE WTC

(collected on September 16 and 17, 2001)

- Polycyclic aromatic hydrocarbons (>0.1% of the mass)
- Polychlorinated biphenyls
- Polychlorinated dibenzodioxins
- Polychlorinated dibenzofurans
- Pesticides
- Phthalate esters

- Plastic

- Partially burned jet fuel
- Soot

- Inorganic metals
- Radionuclides
- Ionic species

- Asbestos (0.8%-3.0% of the mass)

Lioy P, Weisel CP, Millette JR, et al. Characterization of the dust/smoke aerosol that settled east of the World Trade center (WTC) in Lower Manhattan after the collapse of the WTC 11 September 2001. Environ Health Perspect 2002;110:703-712.

COMPOSITION OF DUST AND SMOKE AEROSOL FROM THE COLLAPSE OF THE WTC

(collected on September 16 and 17, 2001)

70% of samples comprised construction materials:

- **Office furnishings**
- **Pulverized cement**
- **Glass fibers (mineral wool and fiberglass)**
- **Wallboard**
- **Paint (leaded and unleaded)**

Lioy P, Weisel CP, Millette JR, et al. Characterization of the dust/smoke aerosol that settled east of the World Trade center (WTC) in Lower Manhattan after the collapse of the WTC 11 September 2001. Environ Health Perspect 2002;110:703-712.

- Dust samples collected at the World Trade Center site on September 12, 2001 were found to be rich in calcium-based compounds

- Calcium-based compounds are known to irritate the upper airways

McGee JK, Chen LC, Cohen MD, et al. Chemical analysis of World Trade Center fine particulate matter for use in toxicological assessment. Environ Health Perspect 2003;111:972-980.

Composition of inhalants from the World Trade Center Disaster

- Organo-chlorine pesticides
- Phosgene
- Cadmium
- Mercury
- Diesel exhaust
- Hydrogen Sulfide

Composition of inhalants from the World Trade Center Disaster

- Carbon Monoxide
- Nitrogen Dioxide
- Nitric oxide
- Sulfur dioxide
- Chlorine
- Phosgene
- Freon

- **Endotoxin**

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HYPOTHESES

1. Pediatric asthma patients exposed to the World Trade Center disaster may experience increased asthma severity.

2. Some previously healthy children may be newly diagnosed with asthma after September 11, 2001.

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ASTHMA IN CHINATOWN AFTER 9/11

STUDY POPULATION

- Chinese-American pediatric asthmatic patients who live in New York City

- Receive medical care at the Charles B. Wang Community Health Center (CBWCHC), located in lower Manhattan's Chinatown, approximately 1.5 miles from the WTC.

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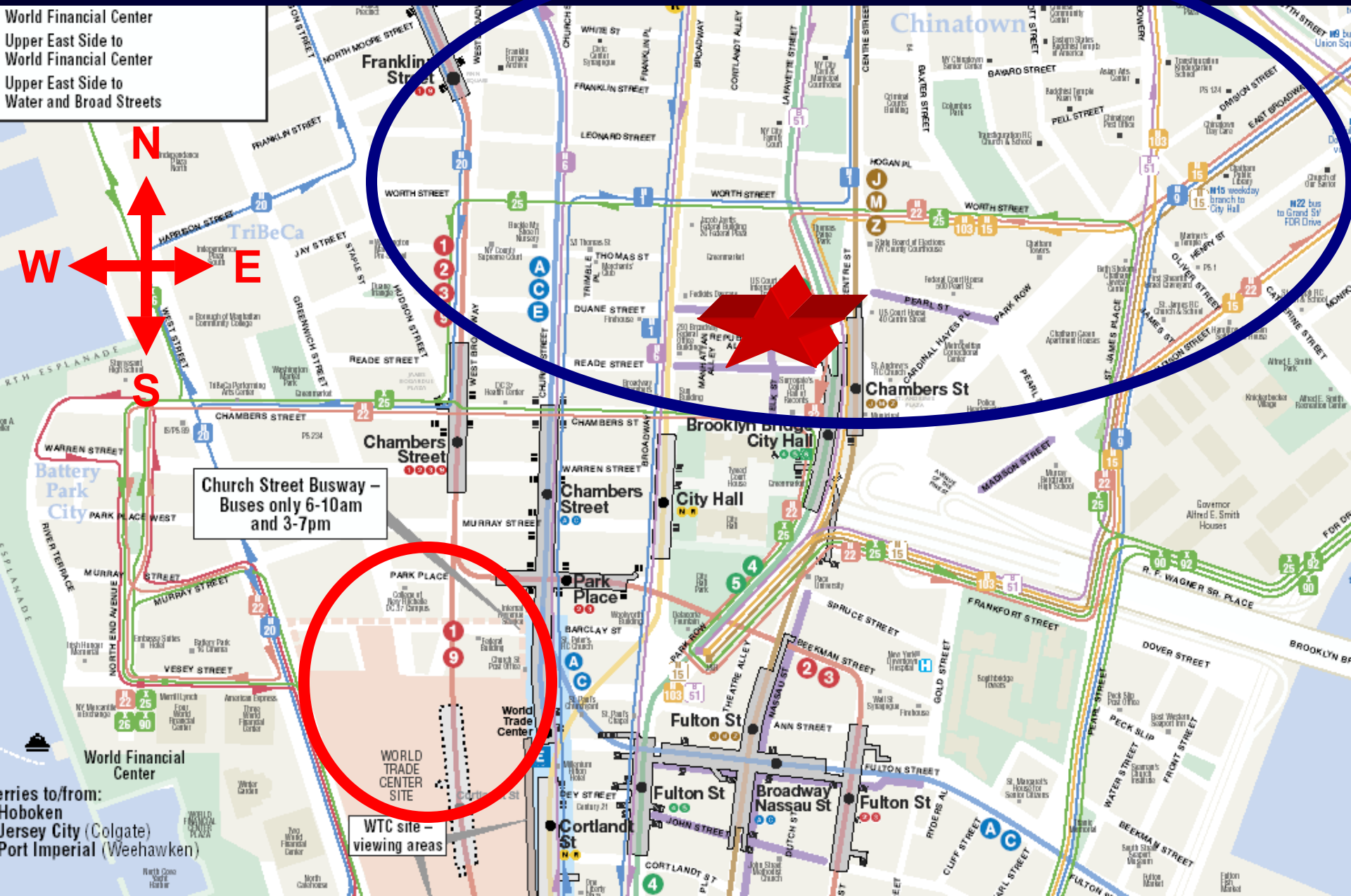

ASTHMA IN CHINATOWN AFTER 9/11

Charles B. Wang Community Health Center

王嘉廉社區醫療中心

ASTHMA IN CHINATOWN AFTER 9/11

STUDY POPULATION

- Eligible subjects included patients younger than 18 years of age (as of September 11, 2001) who had established asthma and enrolled in an asthma registry at the CBWCHC.

- All patients included in the study were given a diagnosis of asthma by a pediatric allergist.

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STUDY POPULATION

Patients younger than 6 years were given a diagnosis of asthma if they had:

- **2 or more episodes of wheezing or coughing within a 12-month period, and**
- **symptoms improved after asthma medication in the clinic.**

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STUDY POPULATION

Children older than 6 years were given a diagnosis of asthma if they had:

- **wheezing, cough, or dyspnea on at least 2 occasions, and**
- **symptoms, physical signs and peak flow rates improved after bronchodilator therapy.**

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STUDY POPULATION

We only included subjects who had:

1. At least one clinic visit for asthma between September 11, 2000, and September 10, 2001.

2. At least one clinic visit between September 11, 2001, and September 10, 2002.

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METHODS/DATA COLLECTION

- Retrospective chart review
- 205 pediatric patients with established asthma from a clinic in lower Manhattan's Chinatown
- Clinical data were obtained for the year before and the year after September 11, 2001

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METHODS/DATA COLLECTION

- Seven physicians trained in internal medicine or pediatrics reviewed 319 patient charts from an established asthma registry.

- Two hundred five patients met the inclusion criteria. Data were extracted onto standardized study forms and then entered into our study database.

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METHODS/DATA COLLECTION

- Numbers of visits to M.D. for asthma
- Number of asthma medication prescriptions
- Use of oral corticosteroids
- Number of weekly doses of rescue inhaler
- Peak expiratory flow rates

ASTHMA IN CHINATOWN AFTER 9/11

METHODS/DATA COLLECTION

- Age
- Height and Weight
  (3 Months Pre- and Post- 9/11)
- Sex

ASTHMA IN CHINATOWN AFTER 9/11

METHODS/DATA COLLECTION

- Residential zip code (MDs blinded)
- Peak expiratory flow rates (PEFRs) liters/min
- The best value of 3 trials was recorded at each visit. PEFRs were obtained from all patients who were able to consistently perform the maneuver.

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ASTHMA IN CHINATOWN AFTER 9/11

Demographic characteristics of Chinese-American pediatric asthmatic patients

CHARACTERISTICS	ALL PATIENTS
Age (yr)	8.18±3.47
Female, n (%)	69 (34.2)
Male, n (%)	133 (65.8)
Height (inches)	48.69±9.71
Weight (lbs)	63.94±31.45

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Demographic characteristics of Chinese-American pediatric asthmatic patients

CHARACTERISTICS	REGION 1 (≤5 mi WTC)
Age (y)	7.81±3.07
Female, n (%)	27 (33.3)
Male, n (%)	54 (66.7)
Height (in)	47.53±7.38
Weight (lbs)	59.80±26.26

ASTHMA IN CHINATOWN AFTER 9/11

Demographic characteristics of Chinese-American pediatric asthmatic patients

CHARACTERISTICS	REGION 2 (>5 mi WTC)
Age (y)	8.42±3.70
Female, n (%)	42 (34.7)
Male, n (%)	79 (65.3)
Height (in)	49.40±10.98
Weight (lbs)	66.57±34.30

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Demographic characteristics of Chinese-American pediatric asthmatic patients

CHARACTERISTICS	REGION 1 (≤5 mi WTC)	REGION 2 (>5 mi WTC)	P Value
Age (y)	7.81±3.07	8.42±3.70	NS
Female, n (%)	27 (33.3)	42 (34.7)	NS
Male, n (%)	54 (66.7)	79 (65.3)	NS
Height (in)	47.53±7.38	49.40±10.98	NS
Weight (lbs)	59.80±26.26	66.57±34.	NS

ASTHMA IN CHINATOWN AFTER 9/11

Clinical parameters in Chinese-American pediatric patients treated for asthma at the CBWCHC, September 11, 2000-September 10, 2002

Clinical Parameter	9/11/2000-9/10/2001	9/11/2001-9/10/2002	P Value
Clinic visits for asthma (no. visits per child)	3.79±3.18	4.69±3.54	.002
Asthma prescriptions (no. of prescriptions per child)	2.05±1.48	2.33±1.19	.018
Rescue inhaler doses per week (no. of doses per child)	7.15±9.46	5.25±8.85	.058
Oral steroid use (% yes)	20±45	19±45	NS

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ASTHMA CLINIC VISITS AND ASTHMA PRESCRIPTIONS INCREASED

ASTHMA IN CHINATOWN AFTER 9/11

Map of New York City with zip codes from patients seen at the Charles B. Wang Community Health Center.

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REGION 1

Clinical Parameter	9/11/2000-9/10/2001	9/11/2001-9/10/2002	P Value
Clinic visits for asthma (no. visits per child)	3.79±3.18	4.69±3.54	.002
Asthma prescriptions (no. of prescriptions per child)	2.05±1.48	2.33±1.19	.018
Rescue inhaler doses per week (no. of doses per child)	7.15±9.46	5.25±8.85	.058
Oral steroid use (% yes)	20±45	19±45	NS

ASTHMA IN CHINATOWN AFTER 9/11

REGION 2

Clinical Parameter	9/11/2000-9/10/2001	9/11/2001-9/10/2002	P Value
Clinic visits for asthma (no. visits per child)	3.71±3.26	4.40±3.21	.063
Asthma prescriptions (no. of prescriptions per child)	2.00±1.46	2.23±1.22	NS
Rescue inhaler doses per week (no. of doses per child)	8.87±10.17	7.57±9.21	NS
Oral steroid use (% yes)	0.18±0.45	0.17±0.45	NS

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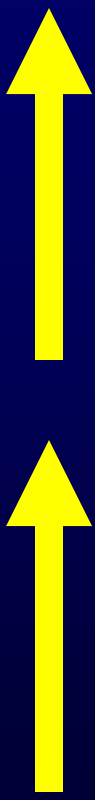
MORE ASTHMA VISITS FOR CHILDREN WITHIN 5 MILES

ASTHMA IN CHINATOWN AFTER 9/11

- Number of children with asthma increased 66%
- Pediatric asthma visits increased 48.8%



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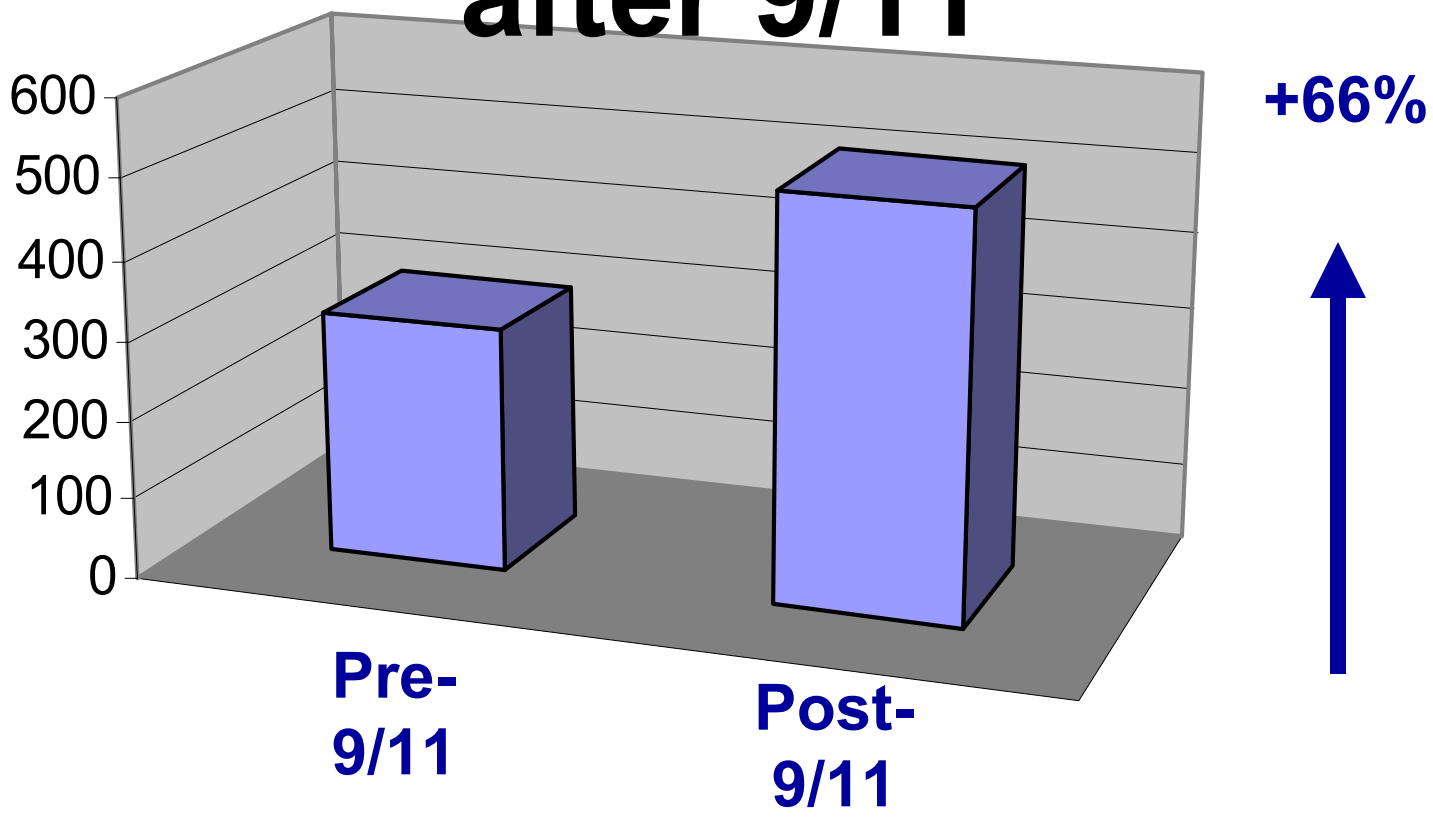
Increase in pediatric patients in Chinatown after 9/11



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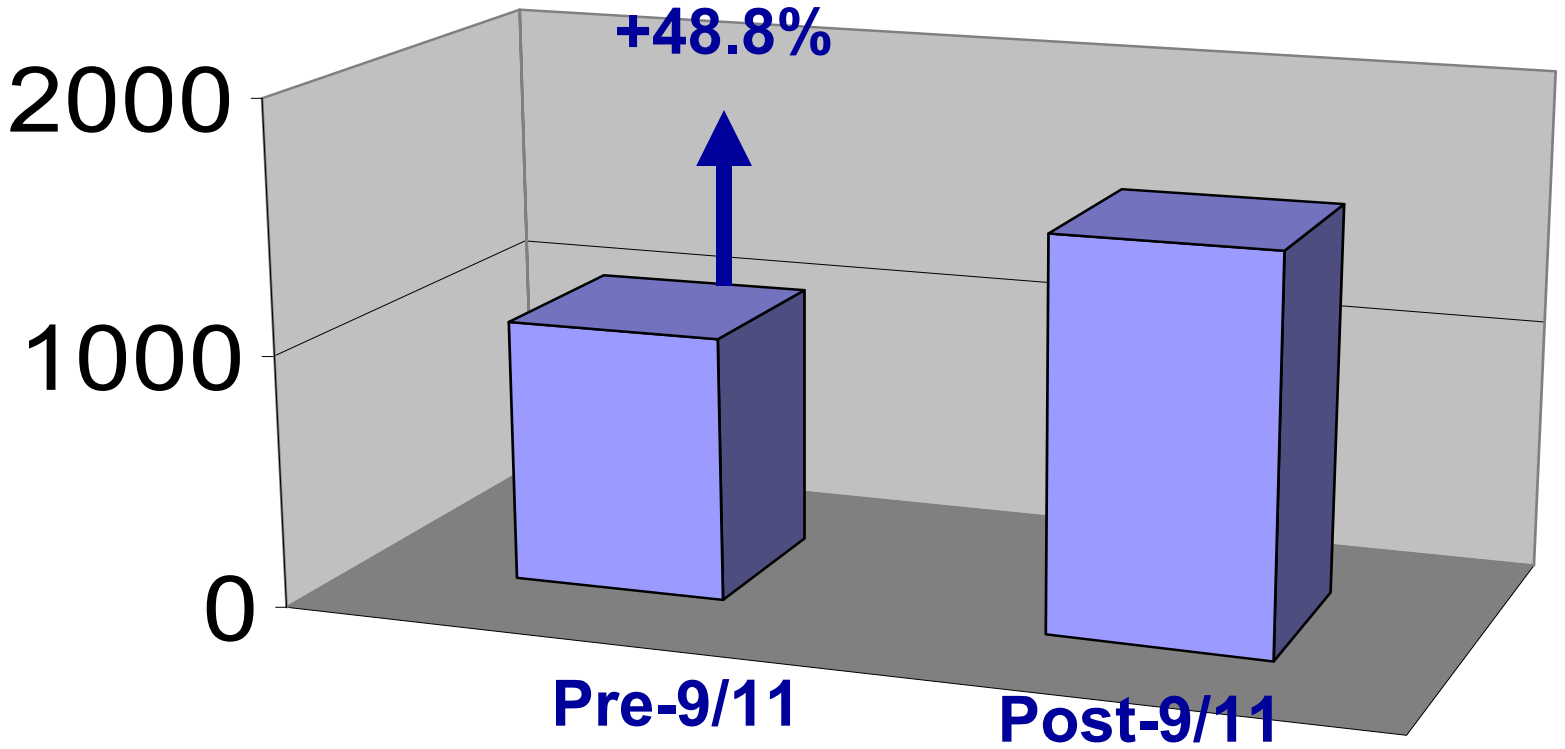
Increase in pediatric asthma visits in Chinatown after 9/11



ASTHMA IN FLUSHING AFTER 9/11

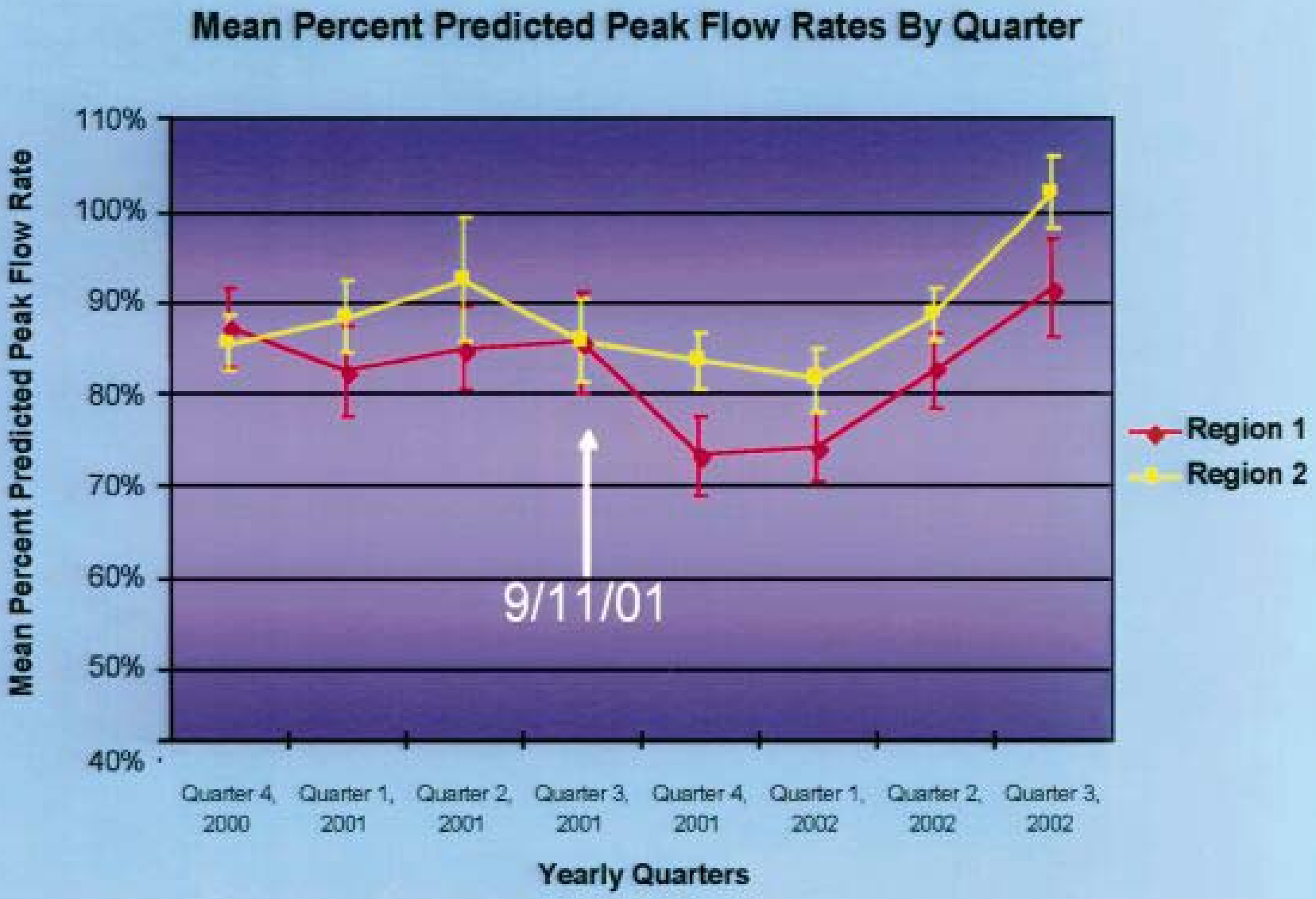
- Number of children with asthma decreased 10.9%
- Pediatric asthma visits decreased 13.6%

ASTHMA IN CHINATOWN AFTER 9/11

Mean percent predicted peak flow rates decreased below 80% of predicted in children living ≤ 5 miles from Ground Zero.

The decrease lasted for 6 months.

ASTHMA IN CHINATOWN AFTER 9/11



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RELATED STUDIES

1. Self-reported increase in asthma severity after the September 11 attacks on the World Trade Center--Manhattan, New York, 2001. *MMWR* 51:781-4, 2002.

2. Banauch, et al. Persistent Hyperreactivity and Reactive Airway Dysfunction in Firefighters at the World Trade Center. *Am J Resp Crit Care Med* 168:54-62, 2003.

3. Skloot et al., Respiratory Symptoms and Physiologic Assessment of Ironworkers at the World Trade Center Disaster Site, *Chest*, 2004; 125:1248-1255.

4. Feldman, et al, Symptoms, Respirator Use, and Pulmonary Function Changes Among New York City Firefighters Responding to the World Trade Center Disaster, *Chest* 2004; 125:1256-1264.

RELATED STUDIES

5. Prezant et al., Cough and Bronchial Hyperresponsiveness in Firefighters at the World Trade Center Site. *N Engl J Med* 347:806-15, 2002.

6. Safirstein et al., Granulomatous Pneumonitis Following Exposure to the World Trade Center Collapse. *Chest* 123: 301-304, 2003.

7. Rom, W., et al., Acute Eosinophilic Pneumonia in a New York City Firefighter Exposed to World Trade Center Dust. *Am J Resp Crit Care Med* 166: 797-800, 2002.

MMWR:

Telephone survey of residents in lower Manhattan 5-9 weeks after 9/11 revealed:

- **13% of respondents had pre-existing asthma**
- **27% of these persons had increased incidence of severe asthma after 9/11**

MMWR:

Even allowing for some seasonal increase in asthma attacks, the increased severity was also associated with self-reported psychological stress, and cough & dyspnea, temporally associated with exposure to dust/fumes.

FIREFIGHTERS AND HYPERREACTIVITY:

- 31% of highly exposed firefighters (32/102) were hyperreactive (PC20 <8 mg/ml) on their first post-WTC challenge test.

FIREFIGHTERS AND HYPERREACTIVITY:

- Hyperreactivity at 1,3, 6 months post-collapse was associated with exposure intensity, independent of ex-smoking and airflow obstruction.

- Highly exposed workers were 6.8 times more likely than moderate or control subjects to be hyperreactive 6 months post-collapse.

- Hyperreactivity persisted in 55% of those highly exposed workers hyperreactive at 1 or 3 months.

PULMONARY FUNCTION IN METALWORKERS:

- **Seventeen** percent of welders who were sent to rescue people at the World Trade Center site had reduced FEV1/FVC 70% after at least 3 days of exposure.

- **Fifty-three** percent of welders had abnormal forced oscillation exams suggesting obstruction.

FIREFIGHTERS SHOW DECREASED FEV1:

- **Firefighters** arriving at Ground Zero within 48 h **showed a decline of ≥450 ml in FEV1** compared to controls

FIREFIGHTERS SHOW AIRWAYHYPERREACTIVITY:

- In another report, 23% of previously healthy firefighters with a high level of exposure (present at the WTC collapse) without severe cough had bronchial hyperreactivity (PC_{20} 8 mg methacholine or less).

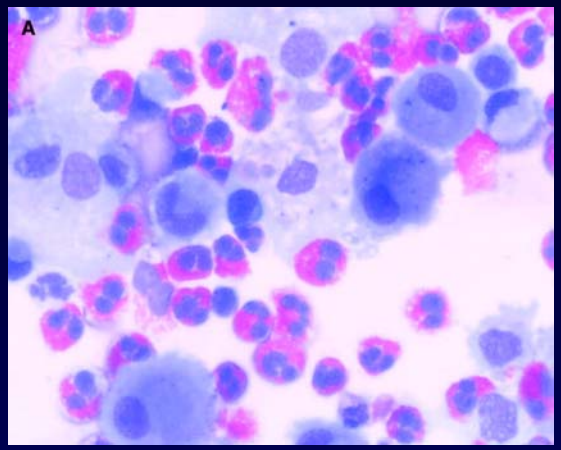
- 8% of those with moderate level of exposure (present within 2 days of collapse) had airway hypereactivity.

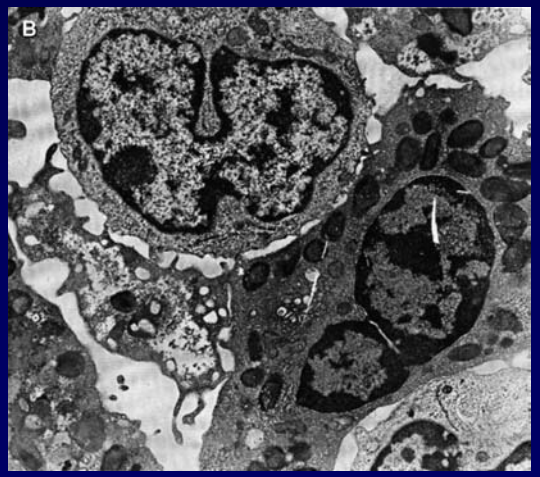
OTHER PULMONARY DISORDERS AFTER 9/11:

- 37year-old engineer with cough, dyspnea, 3 weeks after WTC exposure
- CXR, HRCT diffuse miliary nodularity
- Lung biopsy diffuse noncaseating granulomatous nodules
- Scanning electron microscopy and energy-dispersive radiograph analysis revealed large quantities of silicates

Not specified

OTHER PULMONARY DISORDERS AFTER 9/11:





- (Firefighter with BAL 70% eosinophils, asbestos fibers recovered)

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SUMMARY AND CONCLUSIONS

Exposure to the World Trade Center disaster led to:

INCREASED ASTHMA SEVERITY

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SUMMARY AND CONCLUSIONS

- Children living within 5 miles of Ground Zero had more asthma clinic visits after September 11, 2001. (p=.013)

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SUMMARY AND CONCLUSIONS

- These children received more prescriptions for asthma medications. (p=.018)

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SUMMARY AND CONCLUSIONS

- The increase in visits for asthmatic children living further than 5 miles from Ground Zero was not significant.

ASTHMA IN CHINATOWN AFTER 9/11

SUMMARY AND CONCLUSIONS

- Mean percent predicted peak expiratory flow rates decreased solely for those patients living within 5 miles of Ground Zero after September 11, 2001.

ASTHMA IN CHINATOWN AFTER 9/11

SUMMARY AND CONCLUSIONS

- Asthma severity worsened after September 11, 2001, in pediatric asthmatic patients living near Ground Zero.

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SUMMARY AND CONCLUSIONS

- Residential proximity to Ground Zero was predictive of the degree of decrease in asthma health.

ASTHMA IN CHINATOWN AFTER 9/11

RESEARCH TEAM

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